Subcutaneous tissue closure technique during cesarean delivery: Don't interrupt, better continue

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Abstract

Objectives: To determine the rates of surgical site infections following continuous as compared to interrupted subcutaneous tissue closure technique during cesarean delivery. Design: Retrospective study. Setting: Tertiary, university-affiliated medical center. Population: Term pregnant women who underwent elective or emergent cesarean delivery at our center during the years 2008-2018. Methods: Group allocation was based on type of subcutaneous tissue closure. The study group included women who underwent either elective or emergent cesarean delivery with continuous subcutaneous tissue closure, while the control group comprised those with interrupted subcutaneous tissue closure. We excluded women with suspected infectious morbidity prior to cesarean delivery. Main outcome measures: Rate of surgical site infection (SSI) comparing women who had undergone continuous as compared to interrupted subcutaneous suturing. Results: Final analysis included 6,281 women. We performed continuous subcutaneous tissue closure in 37.4% (1,867/4,988) of scheduled cesarean deliveries, and 45.8% (592/1,293) of emergent cesarean deliveries. The rate of SSI was significantly lower following continuous as compared to interrupted subcutaneous tissue closure, in both elective (2.7% vs. 4.5%, respectively, P=0.031) and emergent cesarean delivery (3.2% vs. 5.4%, respectively, P=0.036), in nulliparous and multiparous women. Similarly, secondary outcomes such as re-admission rates within 6 weeks due to SSI, post-operative maternal fever, and need for antibiotic treatment were significantly lower following continuous subcutaneous closure technique. Conclusions: Continuous subcutaneous closure technique during cesarean delivery yields a lower rate of surgical site infections compared to the interrupted technique.

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Design: Retrospective study.

Setting: Tertiary, university-affiliated medical center.

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Main outcome measures: Rate of surgical site infection (SSI) comparing women who had undergone continuous as compared to interrupted subcutanous suturing.

Results: Final analysis included 6,281 women. We performed continuous subcutaneous tissue closure in 37.4% (1,867/4,988) of scheduled cesarean deliveries, and 45.8% (592/1,293) of emergent cesarean deliveries. The rate of SSI was significantly lower following continuous as compared to interrupted subcutaneous tissue closure, in both elective (2.7% vs. 4.5%, respectively, P=0.031) and emergent cesarean delivery (3.2% vs. 5.4%, respectively, P=0.036), in nulliparous and multiparous women. Similarly, secondary outcomes such as re-admission rates within 6 weeks due to SSI, post-operative maternal fever, and need for antibiotic treatment were significantly lower following continuous subcutaneous closure technique.

Conclusions: Continuous subcutaneous closure technique during cesarean delivery yields a lower rate of surgical site infections compared to the interrupted technique.

Key words: Cesarean delivery (CD), subcutanous suturing, surgical site infection (SSI).

Introduction

Cesarean delivery (CD) rates continues to rise worldwide .[1–3], accounting for more than 26% of births in the United Kingdom in 2015 . Although considered safe, CD is still associated with both short- and long-term maternal morbidities.[4]

Postpartum surgical site complications such as hematomas, seromas, surgical site infection (SSI), and wound breakdown develop in 1% - 2% of both scheduled and emergency primary CDs.[6–8] Risk factors for wound complications include high body mass index (BMI) and comorbidities.[9] One of the preventive measures for reducing the incidence of wound complications following CD is approximation of the subcutaneous tissue.[10] A 2004 Cochrane review addressed this surgical step and demonstrated a significant one-third reduction in all surgical site complications following suturing of the subcutaneous layer.[11] A later meta-analysis further supported a reduction in the odds of developing any type of wound complication following this intervention, particularly in women with obesity and subcutaneous tissue depth [?] 2 cm.[12]

Despite the above evidence of subcutaneous tissue closure superiority, the preferred surgical technique for subcutaneous tissue closure has not been adequately studied. A single randomized controlled trial, comparing continuous to interrupted suturing in women with a BMI $>$ 30 kg/m^2, showed lower rates of all wound complications when using interrupted suturing.[13] However, it appears that results of this study were insufficient to make a clear decision about subcutaneous tissue closure technique. In recent years, specific guidelines addressing each of the pre, intra, and post-CD steps have been developed in an attempt to improve patient outcome.[14-18] These guidelines, which include the Enhanced Recovery After Surgery (ERAS) program, also did not provide a clear statement about the preferred suturing technique for subcutaneous approximation following CD.

Therefore, the current study aimed to report the rate of SSI when comparing two surgical techniques, continuous versus interrupted, of subcutaneous tissue closure during CD.

Materials and Methods

Study procedures

This was a retrospective study of women delivered by CD at our tertiary care center, during 2008-2018. Our Obstetrics and Gynecology department provides care to approximately 15,000 patients annually, including nearly 5,500 births. The study was approved by our local Research Ethics Board (0361-19-RMB). Informed consent was waived for acquisition of de-identified patient data. Patient information was accessed through the hospital's computerized database, including patients' demographics and general medical and obstetric characteristics, in addition to both intrapartum and postpartum maternal and neonatal variables. Furthermore, known associated factors and morbidities relevant to surgical site complications were also identified, such as BMI, total time duration of the CD, diabetes of pregnancy, and number of prior CDs. The data were used for multivariable regression analysis.

The study group was comprised of women with known pregnancy outcomes at or beyond 37 weeks' gestation who underwent either elective or emergent CD with continuous subcutaneous tissue closure (c-STC), while the control group was comprised of those with interrupted subcutaneous tissue closure (i-STC). Gestational age was confirmed by first trimester ultrasound. Exclusion criteria included patients who received any antibiotic regimen other than the routine prophylactic cephalosporin (or clindamycin in cases of drug allergy) before the CD or GBS prophylaxis. We follow the risk factor-based approach and provide intrapartum chemoprophylaxis to prevent early-onset GBS neonatal disease after [?] 18 hours of prolonged rupture of membranes. Wide spectrum intravenous antibiotics are also prescribed to women with suspected intrapartum clinical chorioamnionitis, defined as isolated maternal fever with one or more of the following: maternal tachycardia, fetal tachycardia, leukocytosis, uterine tenderness, and malodorous amniotic fluid, or patients with postpartum endometritis. In addition, we excluded women who underwent CD due to multiple gestation, as these have been shown in a previous studies to have increased rates of SSI.[19]

Our institutional general CD technique is in alignment with the ERAS guideline[15] and consists of the following steps:

1. Regional anesthesia is the principal method of anesthesia.
2. Prophylactic intravenous cephalosporin 2 g, or intravenous clindamycin 900 mg in case of penicillin allergy, is given within 60 minutes of skin incision.
3. The CD surgical site is prepared with chlorhexidine-alcohol scrub.
4. The vagina is scrubbed with 4% chlorhexidine.
5. A Pfannenstiel skin incision is performed.
6. Exposure of the subcutaneous tissue layer, opening of the underlying fascia, bluntly or sharply, is done while maintaining hemostasis, and creating a bladder flap. This is followed by low uterine segment transverse incision and delivery of the newborn.
7. The choice between a single or double layer for hysterotomy site closure is at the primary surgeons' discretion.
8. The peritoneum is not routinely approximated.
9. We close the fascia layer with continuous sutures.
10. Since we cannot measure reliably the subcutaneous tissue layer thickness, it is our department routine to suture this layer with 2-0 Vicryl (Ethicon). The choice between c-STC or i-STC is at the primary surgeon's discretion. c-STC sutures were placed approximately 1 cm from the edge of the incision and 1 cm apart, without excessive tension.
11. At the time of the study, the skin was closed with metal clips, covered with sterilized dressing, and kept dry for approximately 24 hours.
12. Unless complications arise, women are hospitalized for 96 hours, during which evaluation and care of the surgical wound site is made.
13. Metal clips are removed in community health care facilities, usually within 5-7 days postoperatively.

The primary outcome of the study was the rate of postpartum SSI, defined as localized abdominal/wound

tenderness with or without maternal body temperature > 38°C, and at least one of the following: purulent drainage from the superficial incision, culture positive, or incision opened by the surgeon. Secondary outcomes included the rate of re-admission within 6 weeks postpartum due to SSI, rate and duration of maternal fever and antibiotic use, CD-to-SSI time interval, rate of bacteremia/sepsis, and post-op duration of hospitalization.

Statistical analysis

Descriptive variables were reported as means (±SD) for continuous variables and numbers (percentages) for categorical variables. Study variables were compared based on the student t-test, $\chi 2$ test, and ANOVA. A multivariable regression model was used while controlling for significant univariate factors found to be associated with a positive or a negative outcome for surgical site infection including maternal age, BMI, gestational diabetes and duration of CD. A 95% confidence interval was considered statistically significant. SPSS for Windows, version 26 (SPSS, Inc., Chicago, IL), was used for data management and statistical analysis. Separate sub-analyses were performed for both the elective and emergent surgery groups.

Results

Maternal demographic characteristics, depicted in Table 1, were comparable between the groups. Figure 1 presents a flow chart of patients whose subcutaneous tissue layer was closed with either c-STC or i-STC, and provides the primary outcome of the study. During the 10-year study period, 12,896 pregnant women underwent CDs (incidence 23.4%), of whom 6,281 women were eligible for the final analysis. We performed c-STC in 37.4% (1,867/4,988) of the scheduled CDs, and in 45.8% (592/1,293) of the emergent CDs. The rate of SSI was significantly lower following c-STC compared with i-STC, in both elective (2.7% vs. 4.5%, P<0.0001) and emergent (3.2% vs. 5.4%, P=0.031) CDs.

Secondary outcomes are presented separately for elective and emergent CDs in Tables 2 and 3, respectively. Among the scheduled CDs, we observed that rates of readmission (0.9% vs. 1.7%, P=0.0025), post-operative maternal fever (3.2% vs. 5.3%, p=0.021), and need for antibiotic treatment (2.7% vs. 4.3%, P=0.038) were significantly lower in the c-STC group as compared to the i-STC group. Similar findings were observed for emergent CDs. No differences were found in the mean duration of maternal fever, mean duration of antibiotic treatment, CD-to-SSI latency interval, rates of bacteremia and/or sepsis, or duration of hospitalization.

In a separate parity-based sub-analysis, significant findings were in favor of the c-STC group as well. The rate of SSI in nulliparous women was significantly reduced following c-STC as compared to i-STC in elective (2.4% vs. 4.2%, P=0.029) and emergent (3.1% vs. 5.6%, P=0.033) CDs. A lower rate of SSI was also noted among multiparous women after c-STC as compared to i-STC, in both elective (2.8% vs. 4%,P=0.045) and emergent (3.7% vs. 6.5%, P=0.034) CDs. Re-admission rates due to SSI were also significantly lower in nulliparous and multiparous women following c-STC as compared to i-STC both in elective (0.9% vs. 1.7%, P=0.0025) and emergent (1.5% vs. 3.1%, P<0.0001) CDs.

Discussion

Main Finding

The present study implies superiority of c-STC as compared with i-STC approximation technique during CD, with significantly lower rates of SSI, maternal fever, need for antibiotic use, and readmission at weeks postpartum 6. These findings are consistent in both elective and emergent CDs, among both nulliparous and multiparous women.

The overall incidence of postpartum surgical site complications has been reported as 1% - 18%.[6,7,20] These complications disrupt recovery, increase the use of antibiotics and analgesics, and prolong hospitalization.[21] In particular, women with post-operative SSI are less likely to breastfeed and more likely to experience postpartum depression, thus negatively affecting both mothers and their neonates.[22]

Strengths and Limitations

Thus far, the current study is the largest to compare two surgical techniques for subcutaneous tissue closure

during CD, sufficiently large to assess infrequent outcomes between the study groups. The retrospective nature of the study in nature carries some limitations. We were unable to analyze other wound complications such as hematomas, seromas, wound breakdown, and culture results, as these were not adequately reported in the outpatient follow-up of these women. In addition, since in many centers skin closure by sutures or dissolvable staples is the standard of care today, these results may not be generalizable for those practices though the surgical technique still shows a significant decrease in SSI based on a single change in CD steps.

Interpertation

As previously mentioned, subcutaneous tissue approximation during CD has been demonstrated to reduce post-operative wound complications.[23] In a randomized controlled trial of 116 women following CD by Husslein et al. (2014), subcutaneous tissue closure was associated with lower rates of post-operative hematomas as compared to the non-closure group (4% vs. 25%, p<0.005).[24] A 2017 meta-analysis of ten studies (n=3,696) by Pergialiotis et al. (2017), which evaluated the rates of wound complications between closure and non-closure of the subcutaneous layer during CD, reported a significant reduction in all wound complications in favor of the closure technique group (odds ratio 0.66, 95% CI 0.47–0.93).[12] Other studies found subcutaneous tissue approximation to be more efficient with increased subcutaneous thickness.[11,25] Following these results, current guidelines recommend suturing the subcutaneous tissue if the thickness measured is 2 cm and above.[14,15]Nevertheless, there is a limited data regarding the preferred surgical technique.

In a randomized trial, Alalfy et al. (2019) compared 198 women assigned for continuous subcutaneous suturing and 199 women assigned for interrupted sutures.[12] The results indicated significantly higher complications rates in the continuous suturing group as compared with interrupted suturing group. Rates of wound infection in their study reached 8.6% in the continuous suturing group as compared with only 1.5% in the interrupted suturing group (odds ratio 6.1, CI 1.8–21.3, p=0.001). However, one should notice that in contrast with our study, women with previous CD or medical histories, such as gestational diabetes mellitus, hypertension disorders, or a BMI above 30kg/m^2 were excluded. In addition, the methodology of that study has been criticized, as critical information such as sample size calculation, methods of randomization, and reports on the decision of variables used for regression analysis were lacking.[26] In contrast, we demonstrated a significant advantage for continuous subcutaneous suturing, and although retrospective, included a large heterogeneous group of 6,281 patients who may better represent common daily practice. Our cohort, that nearly reached the pooled number of patients evaluated in the meta-analysis performed by Pergialiotis et al.,[12] enabled us to describe and compare outcomes between subgroups of elective and emergent CD.

Conclusion

Our study demonstrated significantly lower rates of post-CD SSI following continuous subcutaneous sutures as compared to interrupted subcutaneous sutures. We believe that performing continuous subcutaneous sutures should be implemented as part of the ERAS guidelines in order to improve patients' recovery following CD. In order to confirm our results, a randomized-controlled trial evaluating these two surgical techniques is currently ongoing in our department.

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Disclosure of Interests: The authors report no financial interest. The authors report no conflict of interest.**Contribution to Authorship:**Conception: RL, YZ, YG, DV Planning: EM, RB, ZW, YG Carrying out: RL, CB, GB, NJ Analysing: RL, NJ, YZ, DV Writing of work: RL, CB, YZ, RB**Details of Ethics Approval:**

The study was approved by our local Research Ethics Board (0361-19-RMB), on: December 2nd , 2019.

References

1. Royal College of Obstetricians and Gynaecologists. Birth after previous caesarean

birth: Greentop guideline no. 45. London, England: RCOG Press; 2015.

2. Betrán AP, Ye J, Moller A, Zhang J, Gülmezoglu AM. The Increasing Trend in Caesarean Section Rates : Global, Regional and National Estimates : 1990-2014. PLoS One 2016;11(2):e0148343.

3. Martin JA, Hamilton BE, Osterman MJK, Driscoll AK. National Vital Statistics Reports Births : Final Data for 2018. NVSS 2019;68(13):1980-2018.

4. Wise J. Alarming global rise in caesarean births, figures show. BMJ. 2018 Oct 12;363:k4319.

5 . Sandall J, Tribe RM, Avery L, Mola G, Visser GHA, Homer CSE, et al. Optimising caesarean section use 2 Short-term and long-term effects of caesarean section on the health of women and children. Lancet 2018;392(10155):1349–57.

6. Carbonnel M, Brot D, Benedetti C, Kennel T, Murtada R, Revaux A, et al. Risks factors for wound complications after cesarean section. J Gynecol Obstet Hum Reprod 2020;50(7):101987.

7. Hager RME, Daltveit AK, Hofoss D, Nilsen ST, Kolaas T, Oian P, et al. Complications of cesarean deliveries: rates and risk factors. Am J Obstet Gynecol 2004;190(2):428–34.

8. Hammad IA, Chauhan SP, Magann EF, Abuhamad AZ. Peripartum complications with cesarean delivery: a review of Maternal-Fetal Medicine Units Network publications. J Matern Fetal Neonatal Med 2014;27(5):463-74.

9. Chelmow D, Rodriguez EJ, Sabatini MM. Suture Closure of Subcutaneous Fat and Wound Disruption After Cesarean Delivery : A Meta-Analysis. Obstet Gynecol 2004;103(5):974–80.

10. Bohman VR, Gilstrap Iii LC, Ramin SM, Little BB, Santos-Ramos R, Goldaber KG, Dax J, Leveno KJ. Subcutaneous tissue: to suture or not to suture at cesarean section. Infect Dis Obstet Gynecol. 1994;1(6):259-64.

11. Anderson ER, Gates S. Techniques and materials for closure of the abdominal wall in caesarean section. Cochrane database Syst Rev 2004;(4):CD004663.

12. Pergialiotis V, Prodromidou A, Perrea DN, Doumouchtsis SK. The impact of subcutaneous tissue suturing at caesarean section on wound complications: a meta-analysis. BJOG 2017;124(7):1018-1025.

13. Alalfy M, Elgazzar A, Fares T, Nagy O, Ellithy A, Lasheen Y, et al. Effect of subcutaneous tissue closure technique in cesarean section on postoperative wound complications in obese Egyptian women. J Matern Neonatal Med 2019;32(15):2452–9.

14. Dahlke JD, Mendez-Figueroa H, Maggio L, Sperling JD, Chauhan SP, Rouse DJ. The Case for Standardizing Cesarean Delivery Technique: Seeing the Forest for the Trees.

Obstet Gynecol 2020;136(5):972–80.

15. Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, Norman M, et al. Guidelines for intraoperative care in cesarean delivery: Enhanced Recovery After Surgery Society Recommendations (Part 2). Am J Obstet Gynecol 2018;219(6):533–44.

16. Tuuli MG, Liu J, Stout MJ, Martin S, Cahill AG, Odibo AO, et al. A Randomized Trial Comparing Skin Antiseptic Agents at Cesarean Delivery. N Engl J Med 2016;374(7):647–55.

17. Smaill FM, Grivell RM. Antibiotic prophylaxis versus no prophylaxis for preventing infection after cesarean section. Cochrane database Syst Rev 2014; (10):CD007482.

18. Mackeen AD, Schuster M, Berghella V. Suture versus staples for skin closure after cesarean: a meta-analysis. Am J Obstet Gynecol 2015;212(5):621.e1-10.

19. Schneid-Kofman N, Sheiner E, Levy A, Holcberg G. Risk factors for wound infection following cesarean deliveries. Int J Gynaecol Obstet Off organ Int Fed Gynaecol Obstet 2005;90(1):10-15.

20. Stone J, Bianco A, Monro J, Overybey JR, Cadet J, Choi KH, et al. Study To Reduce Infection Prior to Elective Cesarean Deliveries (STRIPES): a randomized clinical trial of chlorhexidine. Am J Obstet Gynecol 2020;223(1):113.e1-113.e11.

21. Carter EB, Temming LA, Fowler S, Eppes C, Gross G, Srinivas SK, et al. Evidence-based bundles and cesarean delivery surgical site infections: A systematic review and meta-analysis. Obstet Gynecol 2017;130(4):735–46.

22. Villers MS. Reducing Cesarean Delivery Surgical Site Complications. Obstet Gynecol Clin North Am 2020;47(3):429–37.

23. Chelmow D, Huang E, Strohbehn K. Closure of the subcutaneous dead space and wound disruption after Cesarean delivery. J Matern Neonatal Med 2002;11(6):403–8.

24. Husslein H, Gutschi M, Leipold H, Herbst C, Franz M, Worda C. Suture closure versus non-closure of subcutaneous fat and cosmetic outcome after cesarean section: A randomized controlled trial. PLoS One 2014;9(12):1–12.

25. Vermillion ST, Lamoutte C, Soper DE, Verdeja A. Wound infection after cesarean: effect of subcutaneous tissue thickness. Obstet Gynecol 2000;95(6 Pt 1):923–6.

26. Abbas AM. Comments on: Effect of subcutaneous tissue closure technique in cesarean section on postoperative wound complications in obese Egyptian women. J Matern neonatal Med 2019;32(21):3697.

Table 1 - Maternal demographic characteristics

Maternal demographic characteristics	c-STC group (n=2,459)	i-STC group (n=3,822)	P-value
Maternal age, years, mean ± SD	31.4 ± 5.1	31.2 ± 4.8	0.63
Gestational age at delivery, weeks, mean ± SD	38.2 ± 0.9	38.3 ± 0.8	0.56

Maternal demographic characteristics	c-STC group (n=2,459)	i-STC group (n=3,822)	P-value
Body Mass Index, kg/m^2, mean ± SD	32.8 ± 2.5	32.6 ± 2.7	0.64
Parity, median (range)	2 (0-5)	2 (0-6)	0.81
Nulliparous, n (%)	1,535 (62.4)	2,362 (61.8)	0.47
Number of previous CD, median (range)	2 (0-4)	2 (0-4)	0.85
Gestational diabetes, n (%)	187 (7.6)	275 (7.2)	0.49
Hypertension disorders*, n (%)	145 (5.9)	260 (6.8)	0.29
Duration of CD, minutes, mean ± SD	54.6 ± 11.3	62.5 ± 12.1	0.32
Pelvic adhesions, n (%)	684 (27.8)	1,123 (29.4)	0.33

Abbreviations: c-STC, continuous subcutaneous tissue closure; i-STC, interrupted subcutaneous tissue closure; SD, standard deviation; n, number; CD, caesarean delivery;

*, preeclampsia or gestational hypertension

P-value < 0.05 was considered significant.

Table 2. Outcomes of the study groups after scheduled CD

Outcomes of the study groups after scheduled CD	c-STC group (n=1,867)	i-STC group (n=3,121)	Odds Ratio (95% Confidence Interval)	P-value
SSI rate, n (%)	50 (2.7)	140 (4.5)	1.66 (1.17-2.89)	<0.0001
Re-admission within 6 weeks for SSI, n (%)	22 (0.9)	65 (1.7)	1.88 (1.23-3.21)	0.002
Maternal fever, n (%)	78 (3.2)	203 (5.3)	1.64 (1.12-2.45)	0.024
Duration of maternal fever, days, mean ± SD	3.2 ± 2.1	3.5 ± 2.4	1.09 (0.21-5.36)	0.62
Antibiotic use, n (%)	67 (2.7)	165 (4.3)	1.57 (1.13-2.27)	0.038
Duration of antibiotic use, days, mean ± SD	7.9 ± 3.3	7.5 ± 3.8	1.05 (0.33-2.48)	0.56
CD-to-SSI time interval days, mean ± SD	3.1 ± 2.8	3.4 ± 2.9	1.09 (0.48-6.12)	0.49
Bacteremia and/or sepsis, n (%)	13 (0.5)	28 (0.7)	1.41 (0.66-2.37)	0.33
Post-op hospitalization duration, days, mean ± SD	4.6 ± 2.3	4.9 ± 2.8	1.06 (0.31-3.34)	0.55

Abbreviations: c-STC, continuous subcutaneous tissue closure; i-STC, interrupted subcutaneous tissue closure; SD, standard deviation; n, number; CD, caesarean delivery. SSI, surgical site infection

P-value < 0.05 was considered significant.

Table 3-**Study outcomes after emergent CD**

Outcomes of the study groups after emergent CD	c-STC group (n=592)	i-STC group (n=701)	Odds Ratio (95% Confidence Interval)	P-value
SSI rate, n (%)	19 (3.2)	38 (5.4)	1.68 (1.17-2.24)	0.031
Re-admission within 6 weeks for SSI, n (%)	9 (1.5)	27 (3.8)	2.53 (1.75-3.49)	0.023
Maternal fever, n (%)	31 (5.2)	68 (9.7)	1.87 (1.26-2.41)	0.035
Duration of maternal fever, days, mean ± SD	3.4 ± 2.4	3.8 ± 2.3	1.11 (1.02-3.15)	0.002
Antibiotic use, n (%)	25 (4.2)	48 (6.8)	1.62 (1.21-2.27)	0.044
Duration of antibiotic use, days, mean ± SD	8.3 ± 3.5	7.9 ± 4.1	1.05 (0.41-3.11)	0.59
CD-to-SSI time interval days, mean ± SD	2.4 ± 2.1	2.5 ± 2.2	1.04 (0.13-5.16)	0.38
Bacteremia and / or sepsis, n (%)	7 (1.2)	10 (1.4)	1.16 (0.72-1.48)	0.24
Post-op hospitalization duration, days, mean ± SD	4.4 ± 2.5	5.3 ± 2.6	1.21 (0.39-4.15)	<0.0001

Abbreviations: c-STC, continuous subcutaneous tissue closure; i-STC, interrupted subcutaneous tissue closure; SD, standard deviation; n, number; CD, caesarean delivery; SSI, surgical site infection

P-value < 0.05 was considered significant.

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